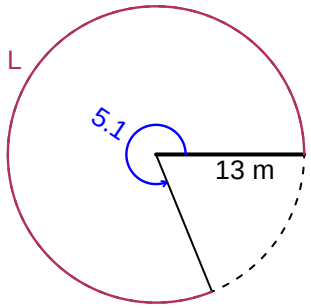
Name: Date:

Trig Final (SLTN v624)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.1 radians. The radius is 13 meters. How long is the arc in meters?

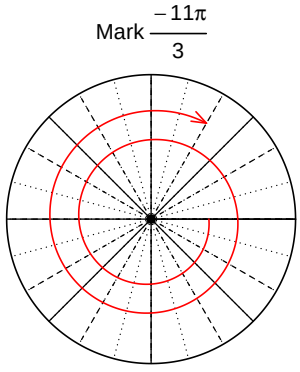


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

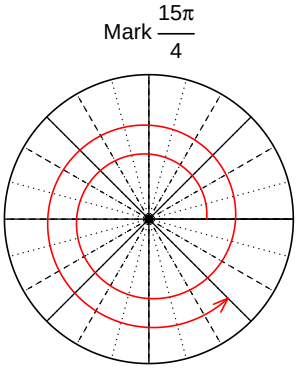
$L = 66.3$ meters.

Question 2

Consider angles $\frac{-11\pi}{3}$ and $\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-11\pi}{3}\right)$ and $\cos\left(\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-11\pi/3)$



Find $\cos(15\pi/4)$

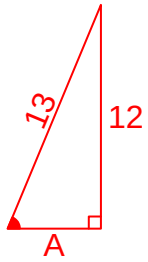
$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-12}{13}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

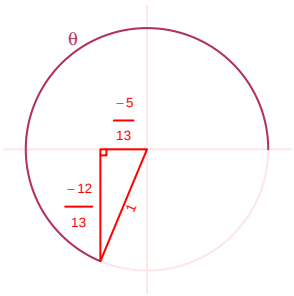
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 12^2 = 13^2$$
$$A = \sqrt{13^2 - 12^2}$$
$$A = 5$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-12}{13}}{\frac{-5}{13}} = \frac{12}{5}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8.89 meters, a frequency of 6.96 Hz, and a midline at $y = 5.19$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.89\cos(2\pi 6.96t) + 5.19$$

or

$$y = 8.89\cos(13.92\pi t) + 5.19$$

or

$$y = 8.89\cos(43.73t) + 5.19$$